

The Research Status and Development Trend of Transmission Seedbed Logistics System in Greenhouse

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Abstract

With the rapid development of Chinese agricultural modernization, transmission seedbed logistics system in greenhouse as a kind of modern agricultural facilities has been getting gradually developed and popularized. First of all, this article introduced the concept of transmission seedbed logistics system and its development status in domestic and international. Then this paper studied its existing technology problems in China. Finally, its development trend was analysed and forecasted.

Keywords

Greenhouse; Transmission Seedbed; Logistics system; Research Status; Existing Problem; Development Trend

Introduction

With the high-speed development of agricultural modernization in China, greenhouse as a kind of modern agricultural facilities has been getting gradually developed and popularized, which is the main form of facility agriculture. It was reported that greenhouse construction areas had been nearly three million hectares by the year of 2009 in China [1-3]. However, as we all know, greenhouse cost is quite high related to national income. In order to use the limited resources to get more economic benefits, firstly, the greenhouse utilization should be improved and the production per unit area ought to be increased as a primary condition. Secondly, the greenhouse should be used to grow high-value crops and cultivate new seedlings and so on. Therefore, the method of improving the greenhouse space utilization, increasing personnel operating convenience in crops becomes the primary problem [4-5]. Greenhouse transmission seedbed logistics system is greenhouse equipment system solution precisely to resolve both conveniently used seedbed and more efficient use of greenhouse space problems. So transmission seedbed logistics system has great application potential, broad development space and promising prospects [6].

The Concept of Transmission Seedbed Logistics System

Transmission seedbed logistics system in general refers to the usage of transmission seedbed, transporting the crop in its special orbit and breeding production crop with the help of computers in the condition of the greenhouse. The system consists of the hardware and software, mainly composed of the central control system, workstations, transmission seedbed dedicated track, transmission seedbed, seedbed crop cultivation area, seedbed handling equipment, cleaning and disinfection equipment, and a complete set of irrigation systems, LED auxiliary lighting system and so on [7-9].

The Current Situation of Greenhouse Transmission Seedbed Logistics System at Abroad

Facility agriculture equipment transmission seedbed logistics system develops very fast abroad, in the United States, Israel, the Netherlands, Australia, Japan and other agriculture developed countries in the facilities agriculture field of transmission seedbed technology keeping a leading place in the world, which have been already put into use in large area in the greenhouse, and the technology is relatively mature. Particularly in the United States, the Netherlands and Japan and other developed countries, transmission seedbed technology has formed a complete system of technology, and some modern transmission seedbed according to different needs to

cultivate crops of growth factors, growth factors for greenhouse crop on transmission seedbed such as temperature, light, humidity, atmosphere, fertilizer monitored and controlled by computer, production management and operation which have achieved the mechanization, and partly achieved to be automatic and intelligent. But there is also the remote control technology application to the transmission seedbed, such as the management of the greenhouse seedbed group technology and automatic control technology. Intelligent management technology is applied, and developed into the trend of unmanned, forming a complete greenhouse seedbed logistics system. In order to fight against global warming, including environmental degradation, increased population, arable land decrease, food safety problems, the economic developed countries successively developed "Plant Factory", for example Europe and the United States, the Netherlands, Japan have "Plant Factory" production of vegetables and flowers[10-13].

According to the developed country in facility agriculture like the Netherlands in the aspect of greenhouse horticulture production and labour costs accounted for the largest proportion of the total cost, the vegetable production is 34%, cut flowers and potted flower production is 27% and 28% respectively, and which are also in growing trends[14-16]. In order to enhance the competitiveness of enterprises in the market and to solve the questions such as labour shortage in the greenhouse flowers production process and high cost of labour, the Netherlands vigorously developed transmission seedbed of automation production equipment logistics system. The Netherlands has successfully developed a variety of automated transmission seedbed system matching with all kinds of greenhouse equipment, such as transmission seedbed dedicated track, seedbed carrier, seedbed forklift, seedbed crown block, seedbed elevator, seedbed cleaning equipment, potted flower carrier and so on, forming a large complete and circulating operation transmission seedbed logistics system[17-21], as shown in Fig.1.

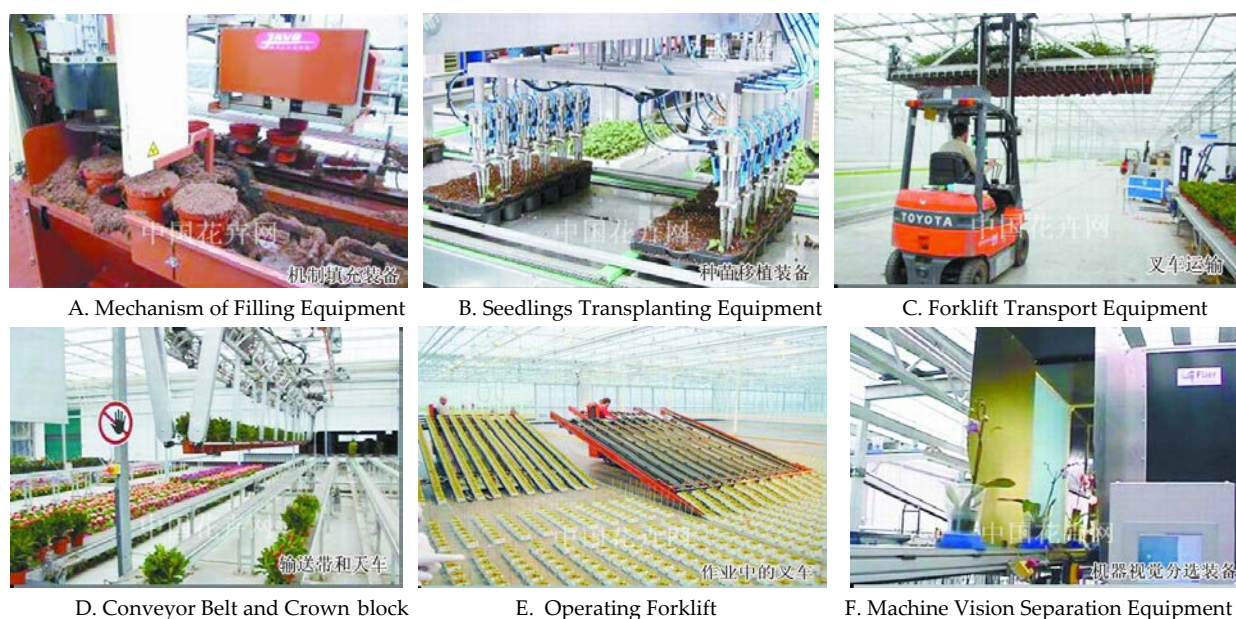


FIG.1 THE NETHERLANDS MODERN GREENHOUSE TRANSMISSION SEEDBED LOGISTICS SYSTEM

The Current Situation of Greenhouse Transmission Seedbed Logistics System in China

Greenhouse transmission seedbed logistics system technology in the domestic started relatively late compared with the facility agriculture developed countries in the world, the research of modern transmission seedbed technology is relatively backward. At the present stage, most areas across the domestic still use manual type transmission seedbed, such seedbed laborious, and greenhouse crop growth environment have high request for closure, temperature, humidity, and the greenhouse environment is not suitable for greenhouse workers work in them for a long time, so researchers have done a lot of research work for greenhouse automation transmission seedbed logistics system. Since the 21st century, in the domestic, greenhouse transmission seedbed logistics system technology and its related equipment have formed a certain scale. China has more than 20 provinces introduction

of modern greenhouse transmission seedbed forming a complete set of equipment and technology from the Netherlands, the United States, Israel, Canada, Japan, South Korea and other countries. Through the digestion, absorption and innovation, China has made a number of major scientific and technological achievements, greatly promoting the development of the factory farming in our country. Many domestic research institutions and enterprises have done a lot of research on transmission seedbed logistics system. In the aspect of transmission seedbed, China has successfully developed a variety of transmission seedbed to suitable for different seedling cultivation situations, the typical representative is that Hangzhou Constant Agricultural Science and Technology CO., LTD. developed multi-layer system and related equipment such as: seedbed truck, seedbed crown block, soilless cultivation nutrient solution irrigation systems, LED lighting systems, computer production management system, and were put into use in Shanghai urban garden, marking a three-dimensional "Plant Factory" of the modernization logistics system in China[22], as shown in Fig.2.



FIG.2 PLANT FACTORY IN CHINA

Transmission Seedbed Seedlings Automation Control Level Increased

In terms of the level of transmission seedbed automation control, our country has gradually get rid of fixed bed, which is the old type with the drawbacks of low productivity, time consuming, and has been developed to be fully automated system for transmission seedbed supporting transmission seedbed logistics system, such as full automatic control of soilless cultivation nutrient solution irrigation system and LED auxiliary lighting system. In such aspects of transmission seedbed facility regulation, the evolution of soil characteristics, fertilizer and water management, special breeding, China conducted comprehensive system research and formed a relatively complete cultivation technique system of agricultural facilities based on transmission seedbed, as well as developed the supporting facilities and production specifications, which make the agricultural production no longer limited to the natural, the overall automation level is greatly increased.

Rich Types of Facility Agriculture Equipment Supporting Transmission Seedbed Logistics System

Transmission seedbed logistics system is widely applied in nursery and cultivation of greenhouse flowers, vegetables and other crops, for its supporting equipment in China, such as: transmission seedbed automatic laminating temperature control device, transmission seedbed tidal irrigation systems, transmission seedbed handling equipment and three-dimensional logistics system of transmission seedbed space elevator and other equipment, which have been carried out extensive research and application, and have been formed the situation that is given priority to with transmission seedbed, a variety of supporting facilities for common development[23-24].

The Main Problems Existing in the Process of the Development of Transmission Seedbed Logistics System Technology

China began the research of transmission seedbed related technology in the late 1980s. After decades of development, China has made remarkable achievements, but compared with the facility agriculture in developed countries, there is still a large gap and many problems existing in the process of development, which mainly

displays in:

Partial Area of Transmission Seedbed Modernization Level is Not High, Control Function is Not Complete

At present, the overall level of transmission seedbed automation and its supporting technology is low, equipment quality closes nevertheless. Many areas still used fixed bed which has low technology, or manual transmission seedbed in greenhouse, whose production level is very low, and the labour cost of which is high and laborious, failing to keep pace with the nice and fast development of national economy. However, in the United States, the Netherlands, Japan and other developed countries, transmission seedbed production technology has formed a complete system of technology, and some modern transmission seedbed according to different needs of growth factors to cultivate crops, growth factors for greenhouse crop on transmission seedbed such as temperature, light, humidity, atmosphere, fertilizer monitored and controlled by computer, production management and operation which have achieved the mechanization, and partly achieved to be automatic and intelligent. In this respect, China has just started and has a larger gap between abroad.

Partial Area Lack of Unified Structure Design Standard in the Aspect of Transmission Seedbed

After recent years of development, our country with greenhouse transmission seedbed technology as the core, has initially formed the basic system of horticultural facilities and equipment, seemingly flourishing, but structure and performance of transmission seedbed developed by domestic research institutions and enterprises are different, which have no specification, standard, failing to form a unified completion design specifications and standards, severely limiting the development of the transmission seedbed and its supporting technology.

The Supporting Equipment Technology of Transmission Seedbed Logistics System is Uneven

At present, there is a big gap in the aspect of transmission seedbed technology to form truly integrated transmission seedbed logistics system, "Plant Factory", in the domestic. Automatic transmission seedbed supporting equipment, such as seedbed dedicated transportation orbit, seedbed carrier, seedbed forklift truck, seedbed crown block, seedbed lifting equipment, seedbed cleaning equipment, seedbed irrigation system, technology research level and so on are in uneven, insufficient supply. Developed countries, however, such as the Netherlands, Europe and the United States and other countries have developed all kinds of automation equipment supporting greenhouse transmission seedbed logistics system, formed a large complete, circulating operation transmission seedbed logistics system. In the aspect of research for supporting equipment, our country is still far from the developed countries, we should introduce, digest and absorb foreign advanced technology to research and develop the practical and efficient supporting equipment to transmission seedbed logistics system with the basis of the basic national conditions of our country and current situation.

The Development Trend

With the rapid development of China's economy and the improvement of people's living standards, the development trend of the most important facilities in greenhouse is transmission seedbed logistics system, which is to improve the practical level and class, to gradually achieve standardization, diversification, systematic, automation and intelligent, forming technology and application system with the characteristic of our country, and to need attaching great importance to the application of existing technologies and achievements, formed "Internet + Agricultural Modernization" high-new-tech industries, achieving large-scale commercial agriculture production.

Transmission Seedbed Logistics System Should Be Further Combined With Modern Industrial Information Technology Further, to Improve the Quality of Hardware, Enhance the Ability for Supporting Equipment

Transmission seedbed logistics system should be closely combined with modern industrial information technology in these aspects of structural engineering, material engineering and water-saving energy-saving projects need further development. At the present times, arable land area of agriculture is shrinking, we should do more research and application in terms of transmission seedbed of three-dimensional, multiple-layer, intelligence to improve the quality of the hardware, do research on transmission seedbed infrastructure technology at the same

time to form a complete recycled transmission seedbed logistics system and build the "Internet + Modern Agriculture" in our country, formed high efficiency low energy consumption of modern agriculture based on the Internet of things technology.

Transmission Seedbed and Supporting Equipment Standardization and Diversification Parallel Development

The research and development of greenhouse transmission seedbed logistics are inclined to be more and more perfect. Development trends, including transportation, seedling tray seeding matrix assembly line, accelerating germination, seedling bed seedling equipment, irrigation systems and subsequent harvest, washing, processing, packaging, storage, transportation and other related equipment are increasing. To develop into an industry which has complete supporting facilities, standardization in design, manufacturing and production process, in order to achieve high suitability, and at the same time of standardization, also should be based on the concrete factory nursery production occasions, research and application multi-types related equipment for the transmission to achieve the unity of the standardization and diversification and promote the development of agricultural modernization.

Transmission Seedbed Logistics System Should Be Closely Integrated with Biological Technology, Developing Modern Green Ecological Agriculture

Modern agricultural facilities transmission seedbed logistics system should be closely combined with biological technology to improve yield and quality of crop in greenhouse, and meanwhile, should take advantage of biological agents, biological pesticides and chemical fertilizers and other specialized production material, should be based on biological growth cycle characteristics of crops such as vegetables and flowers in greenhouse, should be combined with modern automatic control technology, which develops toward to the development trend of precision agriculture, high efficiency, low energy consumption, saving. And at the same time it can provide the society with abundant pollution-free, safe, high-quality green health food.

Conclusions

With the rapid development of modern agriculture in China, the greenhouse transmission seedbed as a kind of modern agricultural facilities has been gradually developed and popularized, greenhouse transmission seedbed logistics system can take full advantage of greenhouse interior space, as well as efficient and quick production of various high value crops. With the concept of "Internet + Agriculture" which suggests that China has put agriculture modernization technology in the national strategic important position, and intelligence, automation, multilayer three-dimensional greenhouse transmission seedbed logistics system related technology not only for reducing labour and increase production, but which is the key to improving quality. At the same time, more intelligent, more efficient and more perfect transmission seedbed logistics system can also improve the utilization rate of agricultural cultivated land in the process of rural urbanization development, which is the indispensable need in the long-term development process of horticultural facilities industry, and which is an advanced technique of modern agriculture equipment technology, considering as the representative of agricultural modernization technology, having great application potential and broad development space for promising prospects.

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